THE CRUSHED STONE JOURNAL

Official Publication
NATIONAL CRUSHED STONE ASSOCIATION

In This Issue—

FEBRUARY, 1931
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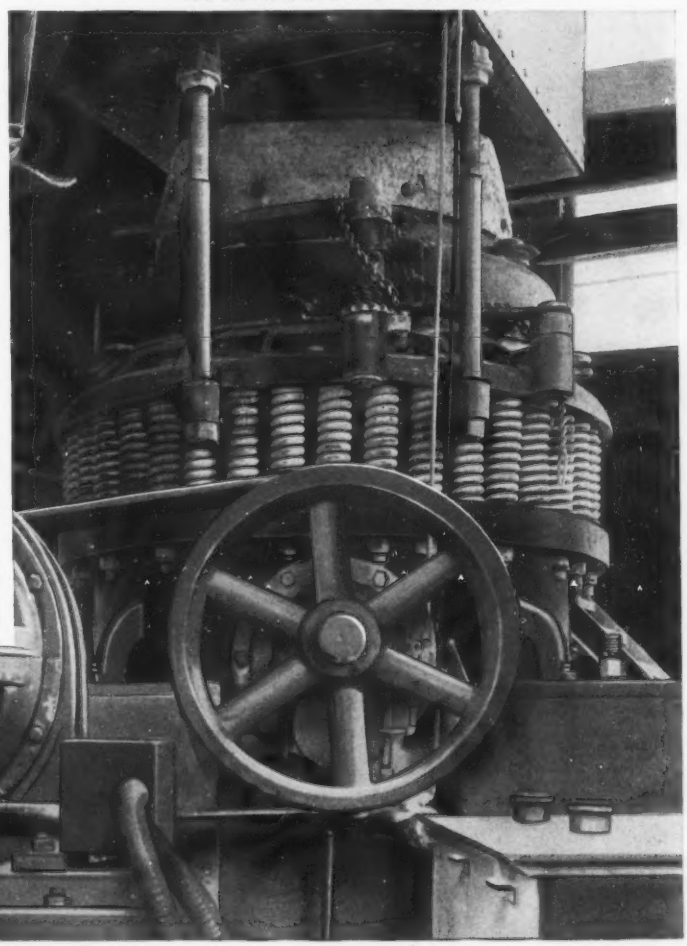
A 5½ foot Cone Crusher is installed in the secondary crushing house in the foreground, while in the screen house beyond are crushers of 3 and 4 foot size.



SYMONS CONE CRUSHER

The Crushed Stone Journal

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J. R. BOYD, Editor

In This Issue

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Progress *in* Mining

The First White Man *to* Mine Lead *in America*

When the Sauk and Fox Indians in 1788 gave permission to Julien Dubuque, an Indian trader, to work the Illinois lead mines which they had operated for centuries, Dubuque gained historical significance as the first white man to mine lead in America.

AMERICA'S mines in 1928 produced 627,000 tons of lead ore, valued at $72,000,000—a development which would have been impossible without modern explosives, scientifically used.

In the country's pioneer days, dynamite was unknown. About 1860, came the first crude dynamites, which, though haphazardly used, sufficed until keener competition necessitated lower mining costs. Then arose the demand for better explosives and better ways of using them—*the demand for explosives research.*

For example, when it was apparent that large scale operations were necessary for economical production, explosives research improved the gelatins so that their fumes were satisfactory for underground use.

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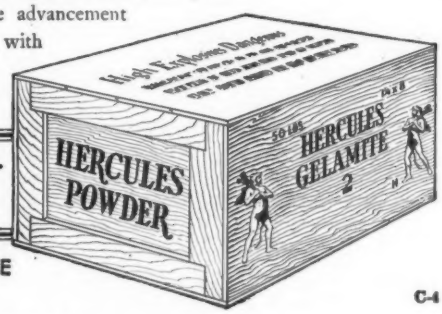
Constant research for better explosives values; insistence on high quality; accurate control in manufacture; exhaustive field tests of new explosives; and advisory service to assist in determining the best methods of application—these are features of Hercules explosives and service that assure full, honest value today and portend future advancement in keeping with mining progress.



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The Economics of Bituminous Road Construction[1]

By BERNARD E. GRAY
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♦ During the last three years there has been a decided gain in popularity of the so-called low-cost surfaces and we are indebted to Mr. Gray in the following paper for an excellent analysis of the present highway situation as it bears upon the economic use of the low-cost pavement.

THE primary object of a transportation system is the prompt and easy movement of persons and goods from one place to another. The degree to which this movement is open to all persons, and within their ability to pay, is the measure of utility of such a system. The development of transportation facilities is the development of civilization, and all further progress depends upon the increasing availability of dependable means of transport. Centuries passed before man had improved his methods from foot to horse and then from horse to steam engine, when, abruptly, the invention of the gasoline motor and the subsequent development of a vehicle which did not require fixed tracks for mobility, brought about more changes in forty years than in all previous history combined.

Extension and Maintenance of Highways Vitally Important

Now while this latter day vehicle does not require tracks, it does require (for the present at least) a travel path on which to run, and obviously the greater the mileage of such paths, the greater the usefulness of the vehicle. The extension of these travel paths, their upkeep and repair, is the largest single duty of public officials in the United States today. It must be self evident that insufficient progress is being made in carrying out this duty, otherwise there would not be so much discussion and argument on the subject.

Several principal materials enter into modern road construction, and the commercial phases have all too frequently had a biased effect, when choice of surface was under consideration. In the few remarks which the writer has to make, he is talking primarily as an engineer and with twenty years of administrative experience in highway building in mind. It is his firm belief that the public does not care a hoot from what a road is built, so long as it is smooth, dustless, mudless and non-skid, and in that condition the whole year around. Black, white, red or green, it is all the same to him so long as he can go the way he wants to go—quickly and comfortably, and at minimum cost. There are several angles to the economics of bituminous construction, but it is the low cost and stage development phase emphasizing salvage, and utilizing natural conditions with which this paper will deal.

Reference has been made to the steam engine, and for purposes of comparison it may be well to examine into the attitude of those charged with the design, construction and maintenance of the two kinds of travel paths which form our present day arteries of traffic, the railroads and highways. In the first group we have had over a hundred years of practical experience, during which time every conceivable type of roadbed has been tried. It is not the purpose of this short paper to develop the changes in that regard. Suffice it to say, that present day practice in this group calls for the flexible type of roadbed, designed for the reasonably near future only, and kept in condition through constant maintenance. It is pertinent to observe that railroad construction and maintenance are ever adjusted to the stern necessity of keeping expenditures at less than the earnings.

[1] Paper presented at the Fourteenth Annual Convention of the National Crushed Stone Association, St. Louis, Mo., January 19-22, 1931.

In the second group, that of highways, there is not apparent the same unanimity of opinion as to the character of the roadbed desired. This confusion obtains for two reasons; one, the lack of continuity in highway administration, and the other, because of the separation of operation from maintenance of way. There is a growing conviction, however, that expenditures are not producing the degree of highway transportation facilities which should be the case, and it is evidencing itself in the large increase in mileage of the so-called low cost surfaces which has taken place during the past three years.

Certain Fundamentals Are Well Established

There are of course, many factors which bear upon the situation, but certain fundamentals are well established. They may be listed as follows:

1. A highway system which does not serve all of an area, and everyone in the area, all the year around, is not functioning completely and the neglected areas and persons are justified in making a loud and mighty protest.

2. That while ten years ago, the building of a new improved surface usually was followed by marked increased traffic, such is not always the case today. In fact there is frequently a temporary decrease, because with the construction of parallel routes, there follows greater dispersion of traffic. The rate of increase in population and motor vehicles will be markedly less in the next twenty years than in the past twenty years, and ample opportunity will be afforded the highway builder so to plan his development as to keep abreast of changing conditions.

3. Certain trunk highways on which traffic flow is already well defined, should be surfaced to take care of such traffic, with reasonable provision against future increase, but all other roads should be improved only in accordance with present day traffic, and with a view to stage development as the future may require.

4. The adoption of a single type of surface arbitrarily over an entire area, regardless of local conditions and materials, is wrong and such a policy will defeat the end sought.

5. The first great outpouring of public funds in the way of bond issues is reaching its peak, and that easy, painless gasoline tax is also reaching such limits as to bring protest, all of which points to the necessity for so planning further developments as to come within current revenues.

6. The improvement in the motor vehicle, notably the pneumatic balloon tire, has had a marked effect on the design requirements for highway surfaces, and the data obtained from tests made several years ago with hard and solid tires is of comparatively little value today.

7. Highway design should primarily emphasize drainage, width, alignment, grade, and surfacing in the order named. Drainage cannot be over-estimated, for in spite of all that has been said and written, this important factor is continually overlooked, and roads have failed unnecessarily because of lack of attention in this respect. Width is placed second because width, properly proportioned to traffic, eliminates concentration of loading and allows sufficient lateral dispersion so that thinner surfacing will be effective than would be the case if all vehicles ran in the same track. Alignment is more important than grade, and by rolling the grade within proper vertical curve limits as to visibility, more economical earth work can be accomplished, also easier drainage. It is believed that in many instances, too much money has been spent in obtaining one per cent to four per cent grades, when short sections of steeper grades would be equally effective. Present day high powered machines are not adversely affected by such design. If all the foregoing requirements are properly met, the last item, that of surfacing, becomes much simpler and cheaper.

8. *Single lane pavements are to be avoided as dangerous.* Taking into consideration the fundamentals outlined, it is believed that more than 80 per cent of the total mileage of highways in the United States can be improved most economically and satisfactorily with bituminous surfaces. It is further believed that this mileage can be improved largely with the low cost types, and that while certain high types of construction will of necessity continue on a considerable mileage, the one outstanding field of endeavor will be found in providing surfaces to cost around $5,000 per mile. The bituminous types are the only ones which lend themselves satisfactorily to this price range and, at the same time, provide wide and safe travelled ways.

Correct Design Considers Varying Subgrade Conditions

For years the design of surfaces was made with a view to obtaining a thickness which would take care of the worst condition, and then arbitrarily to carry it through the entire length of the project, without regard to the varying subgrade conditions. It is advanced that the correct method of design is to grade and drain a proper roadway width, and then to stabilize the surface through cumulative additions of crushed stone or gravel, to such depths as are required. This may be eight inches at one point and two inches at another, thereby utilizing to the fullest extent the inherent subgrade values. Such practice produces uniformity of surface capacity, a characteristic of the greatest importance, because all subsequent stage development of the surface then can be estimated accurately and coordinated with the growth of traffic.

The mileage of highways which have natural subgrades capable of supporting light to medium traffic

during eight to ten months of the year is surprisingly large. The few months of frost and rainy weather make them sometimes impassable, with the result that the material is condemned as bad and the condition is endured until funds are available to lay a heavy pavement. In many cases, the situation could be taken care of by the placement of a relatively thin crust of stone, worked into the subgrade by a grader, and followed with a bituminous treatment to waterproof the surface and reduce abrasion. Such treatment has proved itself many times, but one example in the writer's own experience will illustrate the point. U. S. Route 50 crosses the Shenandoah Mountains from Virginia into West Virginia. In the latter state the road was graded and drained, but funds were not available for paving. During eight months of the year the red clay shale was good but dusty and during the winter and spring it rutted and broke up badly. To relieve the dust it was given an asphalt treatment, of ½ gallon per square yard, covered with 25 pounds of crushed stone chips, and costing $1,200 per mile. The following winter the break-up was less in area and of one month's duration only. The following spring the surface was lightly scarified, the stone worked into the subgrade, and a new treatment given. The end of the third year of such treatments found a surface good for all the twelve months, a total expenditure of $4,000 a mile, all obtained from current revenues, and the road carrying a traffic of 800 vehicles daily, including many trucks and the buses of one bus line. The county roads leading to the state highway were rutted six to ten inches deep and they had a traffic count of less than a hundred vehicles per day. Standing at the junction and watching a car approach at fifty miles an hour on the state road, slow down, turn into the county road, change gears, and grind away at ten miles an hour through the ruts, it was hard to believe that the only difference between the two surfaces is a thin crust of stone and bitumen less than two inches thick. Such treatments are but one of many types and kinds. They are not offered as panaceas for all road ills but they will answer the need in many situations.

Low Cost Surface Not a Temporary Expedient

We all have seen thousands of miles of good stone and gravel roads ripped up, thrown away, and a new

A Section of Bituminous Macadam Construction in Massachusetts

pavement constructed at a cost of $20,000 to $30,000 per mile, when the old surface could have been salvaged with bituminous types, and thereafter maintained, all at a total cost less than the fixed charges on the new construction. Someone challenges and asserts that the traffic may exceed the carrying capacity of the bituminous treatment, but the answer is that the traffic in a majority of cases is less than 1,000 vehicles a day, and increasing very slowly. A study of traffic census records quickly will prove to anyone's satisfaction that, outside of urban areas, the majority of roads carry less than this amount and that such will be the case for an indefinite period in the future. As long as other roads are without any improvement, no light or medium traffic artery is entitled to the expenditure of such sums.

There is needed a different attitude of mind on the part of some road builders, who look upon low cost surfaces as merely temporary expedients. The method which will produce good service at the lowest cost per vehicle per year is the one to use. If one road surface costs $20,000 a mile and $200 in annual maintenance, with a traffic of 500 vehicles daily, the cost per vehicle is $3.60 per year. If a low cost surface requires $5,000 a mile with $500 maintenance, the cost per vehicle is $1.80 per year and, in addition, the surface is becoming continually better. Lest anyone think that $500 per year is an inadequate maintenance figure for the low cost types, let it be said that surface treatments seven years old frequently are found, and that a three to five years' interval is common with traffic running up to 1,000 vehicles per day. A low cost surface is just as much a fixed and permanent part of a properly developed highway transportation system as the most costly type that has ever been devised.

Lack of Knowledge Prevents More Rapid Development

Of course there has been a reason for our failure to develop low cost types earlier on a large scale and that has been our lack of knowledge. There is still much to be learned. The United States Bureau of Public Roads, the state highway departments and associations like our own, through close cooperative effort in carrying on soil studies and other research, are the agencies contributing to better understanding and knowledge. Some of the earlier bituminous treatments were not satisfactory because of lack of skill in building, or insufficient knowledge of material behavior. The writer recalls difficulties in surface treatments on coarse, irregular gravels due to potholing, with resulting roughness and much patching. The dragged surface treatment or the thin mixed-in-place wearing course however, eliminated the difficulty.

Local Authorities Need More Information

The need today is for a simple, accurate, presentation of the extensive data already available and its dissemination to road building authorities. With all the articles which have appeared on the subject, it would seem that this had already been done, but it is a fact that, over large areas of the country and particularly in the political sub-division within the states, insufficient knowledge of correct procedure prevails at the present time. The existence of a rough and uneven bituminous surface on any road is an indication of such lack of knowledge, because, with present technique, there is no excuse for such a condition. You as stone producers may ask, "But where do we come in when pavement thickness is reduced?" Is it better to build six miles of surface, with further additions in thickness through stage development, or is it better to build only one mile? Is it better to have a steady, continual growth, or is it better to have peak loads one year and nothing the next?

Contractors' Favor Will Increase with Development of Mechanical Equipment

With the greater use of low cost bituminous surfaces there is coming a more rapid development of mechanical equipment for handling the operations. Within the near future it will be possible to place surfaces with premixed-stone and bitumen, or surface treatments of various kinds, upon stabilized subgrades of one kind and another, both new and old, at rates of one, two and three miles per day of finished road surface, built under traffic, and at costs which will be within the reach of every pocketbook. At such rates of operation it will be possible to let to contract single projects of from twenty to one hundred miles in length, thus affording a more attractive field to contractors, utilizing modern equipment, scheduling shipments, handling aggregates by conveyor, with machine spreading and finishing on the road surface, and with almost overnight transformation of dusty or muddy roads, into smooth, non-skid highways. Does it sound like a fairy story? Perhaps. But the cold, hard arithmetic of the situation makes such construction the only way, if there is to be obtained a real highway transportation system in this country, before the youngest schoolboy now in the first grade becomes a graybeard of ninety.

Information on Granite Chips Desired

The Washington Office has recently received inquiry as to possible sources of supply for granite chips which are red in color. The chips are to be used in the construction of concrete floors. Anyone having information as to where such material can be obtained is requested to immediately advise the Washington Office.

Economic Features of the Bituminous Type of Road[1]

By C. L. McKESSON[2]

Director, Engineering and Research
American Bitumuls Co., San Francisco, Calif.

◆ In the foregoing article Mr. Gray has given us the viewpoint of the eastern engineer, whereas in the discussion which follows Mr. McKesson has drawn from his extensive experience obtained in the West. It is no mere coincidence that these two papers, discussing as they do the same subject, contain so much in common. Together they should prove a valuable contribution to those interested in the low-cost type of pavement.

ROAD building is primarily an economic problem and engineering considerations cannot be properly approached without fully considering the basic requirements of traffic and the economic limits of permissible expenditures. In the earlier part of the past decade every energy was of necessity bent toward the rapid construction of trunk highways connecting the main centers of population and little thought given to the surfacing of the vast mileage of the secondary system. Expenditures of $50,000 to $100,000 per mile were common, almost usual, and with the almost unlimited funds available, problems of design were relatively simple. Slabs of pavement six to ten inches in thickness and twenty to forty feet in width were the common type and fortunately, due to the heavy traffic served on these major roads, the high costs involved were frequently justified. However, in the haste toward early completion of primary routes these expensive types were sometimes constructed where less expensive types would have served equally well.

Today after twenty years of intensive highway building with billions of dollars of expenditures we have only three per cent of the highways paved with so-called high types and one per cent more paved with intermediate types, ninety-six per cent yet to go. Seventy-eight per cent of the mileage is still unsurfaced earth.

It seems a fit time to pause and review the entire problem so that the relative importance of all factors entering into solution may be fully appreciated.

We have in the United States more than three million miles of rural roads. If it were possible to pave the entire Federal Highway System and all of the State Highways not on the Federal System with high priced, heavy pavements, more than nine-tenths of the total mileage would yet remain to be improved. There are still two million three hundred thousands of miles of earth roads. Recent estimates place the number of motor vehicles at twenty-six million five hundred thousand. On this basis we have less than nine (8.8) vehicles per mile of road. If full development is to be secured economy must be practiced.

Road Building Revenue

Gasoline tax has become the most popular source of road revenue, the average tax being three and two-tenths cents per gallon. Based on five thousand miles of travel per year, per car, and five hundred gallons of gasoline purchased, the revenue per car would be $16.10 (actually it is $16.28 per car) and with 8.8 cars per mile of road, an average annual revenue from this source is $143.26 per mile of road.

Other taxes are being levied against automobiles, including license tax, personal property tax, etc., amounting to $18.72 per vehicle and bringing the total up to an average of $35.00 per auto per year.

The total annual revenue from automobiles if all applied to paving would provide an annual revenue of $2,555 per year per mile from each car using the road once daily. In other words, a mile of highway having a daily traffic of 100 vehicles would receive $255.50 as its proper apportionment of the total auto tax revenue.

Table No. 1 has been prepared to give an approximate idea of how far this revenue goes toward paying the annual cost of the recognized minimum types of standard pavements. The construction and maintenance costs assumed in preparing this table are believed to be conservatively low considering averages throughout the country. This table indicates that each mile of twenty foot by seven inch pavement costing $20,000 must carry an average of nearly one thousand vehicles per day for the entire year in order to stay within its prorata of the gas tax and other auto revenue.

Many miles of paved highway have been constructed in the United States at a cost of $20,000 or more which do not average more than three hundred to five hundred vehicles per day throughout the year and these roads are using revenue belonging to other roads.

[1] Presented at the Fourteenth Annual Convention of the National Crushed Stone Association, Hotel Jefferson, St. Louis, Mo., January 19-22, 1931.

[2] Member A. S. C. E.; Am. Conc. Inst.; Am. Assn. Asp. Technologists; A. S. T. M.

TABLE No. 1—ANNUAL COST OF STANDARD PAVED SURFACES
in relation to
Revenue from Automobiles (Including Gas Tax $16.28, License Tax $18.72 etc. Total $35 per car

Average Number of Vehicles Per Day	Annual Revenue Per Mile	Type of Pavement	Cost of Pavement* (Base and Wearing Surf.)	Interest at 5%	Resurfacing Fund		Maintenance Per Year	Total Annual Cost	Profit (+) or Loss (−)
					Years‡	Per Year			
2000	$5110	24'x7" Pavement	$25,000	$1250	10	$1000	$350	$2600	+$2510
1000	2555	20'x7" Pavement	20,000	1000	12	800	250	2050	+ 505
500	3277	18'x7" Pavement	18,000	900	14	720	200	1820	− 543
300	766	16'x7" Pavement	16,000	800	15	640	200	1640	− 774
200	511	16'x6" Pavement	15,000	750	16	600	150	1500	− 989
120†	316	16'x6" Pavement	15,000	750	18	550	150	1450	− 1134
100	255	16'x6" Pavement	15,000	750	20	500	100	1350	− 1095

* Cost of Sub-base, grading structures and right of way not included. † Average traffic per day per mile of Rural Roads based on gas tax. ‡ Years between resurfacing operations.

Low Cost Roads Must Solve the Problem

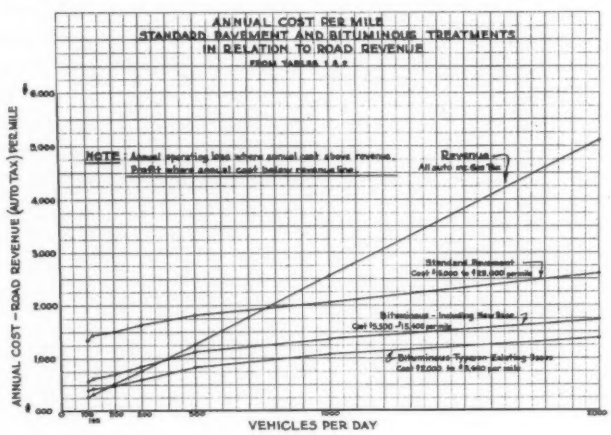
Seven years ago our most eminent road builder, Mr. Thomas H. MacDonald, gave expression to the idea which has since gained almost universal recognition, saying, in substance—"The need is not for greater refinement in the standard methods of paving, but the development of cheaper types adequate for the traffic requirements of the vast mileage of secondary roads."

Bituminous Types and Their Economic Advantages

Bituminous types make possible the construction of low cost roads which are economical to maintain and which meet the service demands of an exacting public.

Table No. 2 shows the relation of earnings to annual cost for various bituminous types which would be adequate for the traffic involved. While Table No. 1 shows the annual cost to be more than the tax collected from the autos using the road where traffic is less than 800 vehicles daily, Table No. 2 shows that properly designed bituminous types are self-supporting with a traffic of 200 vehicles per day with a handsome surplus of tax money left when traffic is over 500 cars per day. Such a surplus means many more miles of road and that within reasonable time all autoists who are contributing revenue will secure proper highway service.

FIGURE 1. Weston-Worcester (Mass.) 2½ inch Asphaltic Penetration Macadam Pavement on 4½ inch Macadam Base on Gravel Sub-Base. Constructed 1913-1914. Never resurfaced. Maintenance $40 to $60 per year. Photographed November, 1929.



Bituminous Types for Heavy Duty

Asphaltic concrete types on asphaltic base and on cement concrete base have general recognition as being suitable for heavy duty service but we have sometimes lost sight of the marvelous service and low annual costs which have been secured from penetration types with proper gravel or macadam bases. Massachusetts, Rhode Island, Connecticut, Pennsylvania, and many other states have striking examples of this kind of work. Only one example will be cited to illustrate the point.

Figure No. 1 shows a section of the Weston-Worcester (Mass.) Highway constructed in 1913. After seventeen years of heavy duty (eight thousand to twenty thousand vehicles per day) this pavement is in perfect condition and is maintained at a cost of about $60.00 per mile per year. Analyzed on the basis

used in Table No. 1, this section would show an operating profit of $20,000 per mile or more per year including an annual allowance for surfacing, which is not yet needed.

Bituminous Types for Light and Medium Traffic

It is in this field that bituminous types are indispensable. Cement concrete does not lend itself to thin surfaces and cannot be used over flexible bases. Bituminous types are therefore alone in this field.

Some of the outstanding economic advantages of bituminous treatments and surfaces are as follows:

1. They make possible the utilization of existing gravel or macadam bases.
2. They immediately stop the loss of road metal and in this saving alone soon repay their cost. (The loss of road metal frequently amounts to $700 to $1500 per mile per year).
3. They are easy and economical to maintain.
4. Variations in thickness from ¼ inch to as many inches as may be needed as are possible with bituminous types.
5. They are perfectly adapted to stage construction, because of flexibility on new grades and that they may be built up gradually in thin layers.
6. They are easy to widen or thicken to meet increased traffic requirements.
7. Their initial low cost makes possible many more miles of construction of dustless, smooth riding pavement where funds are limited.
8. They reduce tire wear on metalled surfaces from 50 to 75 per cent.

Non-Skid Surfaces

Until recent years the tendency to slipperiness and corrugation was sometimes an objection to bituminous treatments but the increased skill in the use of bituminous binders and the development and use of emulsified asphalt for penetration and surface treatment work during recent years has now made possible the elimination of excesses of asphalt in such work and the construction of ideally non-skid surfaces.

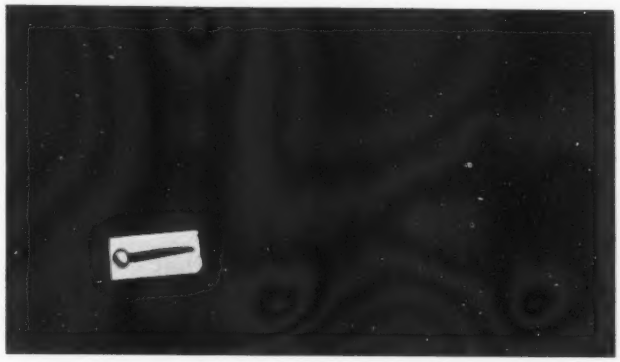


FIGURE No. 2. Typical Non-Skid Surface—3 inch Bituminous Penetration Pavement (emulsified asphalt). (Ridge Route in California, between Los Angeles and Bakersfield).

Figure No. 2 shows a typical non-skid surface after thirty months of heavy trucking and passenger traffic.

Typical Examples of Economical Construction

The possibilities of the economical use of asphalt in meeting varied problems of road building will be illustrated by a few typical examples.

Stage Construction Over Yielding Foundation

The City of San Francisco has been building a new system of arterial boulevards involving heavy cuts and fills.

TABLE No. 2—ANNUAL COST OF BITUMINOUS TREATED SURFACES
In relation to revenues from Automobiles (including Gas tax $16.28, License tax $18.72, etc.)

Average Number Vehicles Per Day	Annual Revenue Per Mile	Type of Surface	New Base and Wearing Surface							Using Existing Macadam or Gravel as Base			
			Cost*		Annual Cost Pavement Only (Per Mile)								
			Macadam Base	Bituminous Surfacing	5% Interest	Renewal Fund Years†	Renewal Fund Per Year	Maintenance	Total Annual Cost	Profit (+) or Loss (−) on Revenue	Total Cost (Per mile)	Total Annual Cost‡	Profit (+) or Loss (−) on Revenue	Annual Saving per Mile over Paving Table No. 1
2000	$5110	24′ wide 3″ Bit. Top 5″ Crushed Stone	$7000	$8400	$750	5	$630	$350	$1730	+$3380	$8400	$1380	+3730	$1220
1000	2555	20′ wide 3″ Bit. Top 5″ Crushed Stone	5600	7300	645	5	520	200	1365	+ 1190	7300	1085	+1470	965
500	1277	20′ wide 2″ Top 5″ Crushed Stone	5600	4800	520	6	400	200	1120	+ 157	4800	840	+ 437	980
300	766	18′ wide 1″ Armor coat 5″ Crushed Stone	5000	3000	400	7	300	150	850	− 84	3000	600	+ 166	940
200	511	18′ wide Light Bit. Surface 5″ Gravel	4000	2000	300	7	300	100	700	− 189	2000	500	+ 11	1000
120	316	18′ wide Light Bit. Surface 5″ Gravel	4000	2000	300	8	225	100	625	− 309	2000	425	− 109	1025
100	255	16′ wide Light Bit. Surface 4″ Gravel	3500	2000	275	8	200	100	575	− 320	2000	400	− 145	950

* Cost of sub-base, grading, structures and right of way not included. † Years between bituminous treatments, charge to cover reconstruction. ‡ Total annual cost is annual cost with base minus interest charge on base.

Figure No. 3 shows a side view of a fill made on one of these new boulevards. The fill was made by end dumping and much settlement was expected. The

FIGURE No. 3. Side view of 50 foot fill on Bernal Avenue, San Francisco. 5/8 inch crushed stone base.

boulevard crosses many heavily travelled streets and immediate paving was necessary to care for the heavy traffic. As soon as the fill was completed it was covered with a layer, five to ten inches in thickness, of soft red crushed rock from a nearby hill and then surfaced with a 2½ inch emulsified asphalt (Bitumuls H Grade) Penetration Wearing Surface.

Figure No. 4 shows the pavement after several months of pounding under traffic. The varying curb face and crooked traffic lines show the settlement, which has not, however, appreciably damaged the pavement. The cost of this pavement was less than $1.00 per yard for base and top and, when finally resurfaced and brought to correct grade, will still be less than one-half of the cost of adjoining pavement of standard type constructed on solid sub-base.

Four years ago the California Highway Department made line changes in their main coast highway and a surfacing was immediately necessary to carry traffic while fills were settling. A supposedly "temporary" pavement was constructed, consisting of a four-inch macadam base and a two-inch penetration top, using

FIGURE No. 4. Bernal Avenue, San Francisco

emulsified asphalt (Bitumuls Grade H) as a binder. The cost of this pavement was about half that of a standard type used on similar sections on good sub-base, yet after four years of use, all of the sections are in perfect condition without a cent having been spent for maintenance. Some of the remarkable success on this section was probably due to the high grade crushed stone used in its construction.

Figure No. 5 shows the pavement after forty months of use and Figure No. 6 shows the perfect non-skid texture yet remaining.

FIGURE No. 5. Two inch Emulsified Asphalt (Bitumuls H Grade) on 4 inch Macadam Base, U. S. Route No. 101, near San Ardo, California.

FIGURE No. 6. Close-up view showing non-skid texture of pavement shown in Figure No. 5 after 3 years of heavy traffic service.

"Armorcoating" or "Retreading" Metalled Roads

Perhaps one of the greatest fields for the economical construction of bituminous surfaces is in "Armorcoating" or "Retreading" roads which have sufficient metal to carry traffic loads but which are dusty, rough and expensive to maintain under traffic.

Two typical examples will be cited. On Kentucky Route No. 33, near Carrollton, the existing surface was built from over-sanded river gravel with little binding value and the road was rough and dusty. The "Retread" construction consisted of the addition of 1½ inches of crushed limestone, followed by scarifying to loosen old material about one inch. The new and old materials were mixed with emulsified asphalt (Bitumuls HRM Grade), finally sealed with the same ma-

terial, at a total cost, including the new limestone, emulsified asphalt, labor and equipment, of only $3,234 per mile.

Figure No. 7 is a typical view after completion.

On the Pacific Highway in California, near the Oregon line, the existing surfacing consisted of traffic bound crushed stone and gravel surfacing. Some sections had been surface treated with light road oil but

FIGURE No. 7. Kentucky Route No. 33, near Carrollton, Cold Asphaltic "Retread."

FIGURE No. 8. U. S. Route No. 99 near Oregon line. One inch Emulsified Asphalt (Bitumuls HX Grade) Armorcoat.

traffic is fairly heavy (two thousand to four thousand vehicles per day). Early in 1930 a seventeen mile section from Yreka to Gazelle were given a one inch "Armorcoating," twenty feet in width, at an average cost of approximately $2,850 per mile. The crushed stone was spread mechanically and bladed and broomed into place and the emulsified asphalt applied with pressure distributors in three applications. The resulting roadway shown in Figure No. 8 is smooth, uniform and non-skid.

Reconstruction of Old Pavement

Great economies are effected by "Armorcoating" or "Retreading" old and badly worn pavements.

Figure No. 9 shows an old asphalt street in Berkeley, California, one year after resurfacing with an emulsified asphalt retread 1½ to 3 inches in thickness. The total cost for bitumuls, crushed rock and labor was only 6.4 cents per foot. The pavement is on a 12 to 17 per cent grade and remains perfectly non-skid in texture.

FIGURE No. 9. Le Conte Avenue, Berkeley, California, Cold Asphaltic (Bitumuls H Grade) Penetration Pavement.

Salvaging of Gravel Roads

The modern practice of efficient salvaging of a gravel road by using it as a base for a very light bituminous wearing surface finds an outstanding example in the Niles Canyon job in Alameda County, California. This is a county road carrying two thousand or more vehicles daily and on Sundays and holidays several times this number. Early in 1927, realizing that blading, dragging and sprinkling were becoming unreasonably expensive, the County Engineer, George Posey, constructed a double surface treatment consisting of two one-third gallon applications of emulsified asphalt to the swept roadway, each application covered with about twenty pounds per square yard of screenings, broomed and rolled. The total cost of the work, about $1800 per mile, was fully repaid by two years' saving in maintenance and the durable asphaltic surface obtained after four years is being maintained at a cost of $100 per mile per year.

Figure No. 10 shows a typical view after over two years of use.

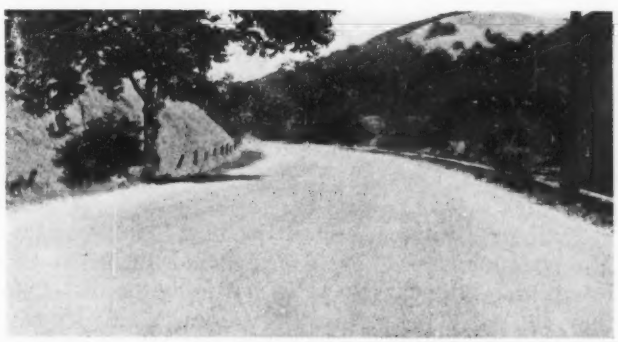


FIGURE No. 10. Niles Canyon Road, Alameda County, Calif.

This improvement analyzed for total annual cost, as in Tables No. 1 and No. 2, would show a surplus over automobile revenue of $4,425 per mile per year after

deducting for maintenance interest and providing for retreatment at five year intervals. Compared with standard pavement in Table No. 1 it will be seen that the taxpayer is being saved $2,000 per mile per year because of the selection of this economical type by his engineer instead of a hard surface type. This improvement corresponds in construction details with the one shown in Table No. 2 designed to carry two hundred vehicles daily, but it is successfully carrying ten times that amount of traffic.

Conclusion

Engineers and road officials cannot afford to ignore the possibilities of effecting such savings; nor, in view of hundreds of similar examples throughout the land, can they justify the expenditure of $20,000 to $30,000 per mile where traffic can be served with a lighter bituminous type utilizing existing metal as a base and frequently constructed at a cost of one-tenth of the cost of standard pavement.

Discussion of the Two Preceding Articles

By GEORGE E. MARTIN
Consulting Engineer, The Barrett Co., New York City

THIS time I can agree with Messrs. Gray and McKesson. We do not always agree, but in this particular instance, I am pleased to back up everything that they have said. I am in a sort of position to say, "I told you so." I have been talking to you fellows about the low-cost roads for a good many years and what ought to be done. You have seen today some of the reasons why those things ought to be done, from one standpoint, and some examples of things that have been done from another standpoint.

In the past I have tried to tell you a little bit about marketing your product, incidentally our product, in the low-cost road field.

There are just one or two things in Mr. Gray's paper that I would like to touch on a little bit and amplify to a certain extent, if I may.

One is the fact that the time for isolated, small sections of high-cost pavement is past. The public will not be satisfied with a few miles of pavement here and there. They must be connected so as to get the ordinary fellow in on the main highways. That is where this low-cost road proposition enters in most effectively, because it is absolutely necessary to get these people out to the main highways, which must be in many cases of the more expensive, high-cost type of construction.

Then Mr. Gray made another point. That was that in a good many cases the engineers have more or less caught up. They have a little more time to plan what they will do in the future. There was a time, not so very long ago, when they were pretty rushed. Traffic was descending on them in an avalanche. A good many of them have dug out of that now and they can take a little more time to plan what they are going to do and to carry on the work in that manner.

He made one other statement. That was that the single-lane pavement is dangerous. I would like to emphasize that specifically. The single-lane pavement is undoubtedly a dangerous proposition. The only time you want a pavement is when you can not get over the road made of the natural sort. If you have a single-lane pavement, it is impossible to pass on it, of course, and you do not get the full effect of the pavement, due to the fact that you only have the one lane, and that the surrounding section is practically impassable.

It is a whole lot better to spend the money in making wider pavements. Not only will that give you better traffic service, but it will reduce the maintenance cost, because the maintenance costs are necessarily high on narrow, one-track, single-lane pavements, which do not have any place in our highway system at the present time.

We have had a good many cases of specific examples where there could be active cooperation between the bituminous producers and the aggregate producers. I have in mind, for instance, one State where they do a great deal of work, surface treating a low-cost type. Several years ago, they used local sand covering and the work was not good. The results were fair, but the roads were rough, they bunched up, and they did not go through the winter in the way they should.

We recommended that they abandon the local sand covering, which they got alongside the road, and that they go to hard, crushed aggregate. We had some argument about it, because it was going to cost more money. We finally succeeded in getting them to try it out. They tried it out in a few places. That particular State at the present time does not cover a single square yard of surface treatment with anything except a hard, crushed aggregate.

There, gentlemen, is something we have done for you people, not entirely unselfishly. It helped us out, of course. We got better results. Those are some of the things that can be done by cooperation between the industries involved.

I feel very strongly on this low-cost proposition, and here is a point where we can get together to the advantage of everybody concerned. It is to the advantage of the taxpayer; it is to the advantage of the road user; it is to the advantage of the contractors, because methods are going to be worked out whereby a number of these things can be done by contract, which could not be so done before. It is going to be to the advantage of the machinery producers, because we are going more and more to machine operations in this work, it is certainly to the advantage of the aggregate producer, and since practically nothing else can be used so far as we know yet, except the bituminous materials, it is to the advantage of the bituminous materials men.

So we have an opportunity to all pull together to accomplish a great deal for the good of all of us. I thank you.

Federal Aid Stimulated Greatest Road Building Program in 1930

NEW Federal-aid road projects initiated by the various State highway departments during the calendar year 1930 exceeded all previous years and involved Federal aid to the extent of $125,780,000 as compared with $74,616,000 in 1929, according to the Bureau of Public Roads of the U. S. Department of Agriculture. This is the result of the legislation of April 4, 1930, which increased the Federal participation from $75,000,000 to $125,000,000 for the fiscal year ending June 30, 1931, and provided equal amounts for 1932 and 1933. The additional $50,000,000 for the fiscal year beginning July 1, 1930, was apportioned immediately and the States responded by initiating many projects which otherwise could not have been proposed because of lack of funds.

The increase in Federal-aid funds will have a considerable effect on road construction and employment in 1931, the bureau says. At the beginning of the year 9,088 miles of Federal-aid roads were under construction at a total cost of $233,397,046 and involving $99,572,832 of Federal aid. There were also 2,875 miles to be placed under construction at a total cost of $60,393,635 and involving $25,530,501 of Federal aid.

The funds available for new projects on January 1 amounted to $144,725,776 of regular Federal-aid funds and the recent emergency appropriation of $80,000,000 to be advanced to the States for use in matching the regular Federal-aid funds.

States to Spend Billion Dollars for Public Construction

CONSTRUCTION divisions of 45 States are planning the expenditure of a total of $1,065,000,000 this year for State buildings and State highways, according to data collected through the cooperation of *The United States Daily* for Col. Arthur Woods, chairman of the President's Emergency Committee for Employment. This figure includes $212,600,000 in buildings and $852,400,000 for State highways, for which construction is either already authorized or is contemplated in the administration programs now under consideration by State Legislatures.

Construction contemplated under these programs will be paid for in part by unexpended balances from appropriations of previous years, in part by tax levies of the current year, and in part by bond issues. In addition to these sources of funds, many States finance a part or all of their highway construction programs through the revenue from gasoline taxes, motor vehicle license fees, and other similar sources..

Leading all States in the total amount of construction planned for the current year is New York, whose legislative budget calls for expenditures of $103,000,000 for highways and public buildings. California, with a building and road program calling for $79,854,000, Louisiana, with $54,000,000, and Illinois, with $52,000,000, will likewise contribute an important measure of relief for unemployment.

St. Louis Group to Receive Instructions in First Aid

AT the February meeting of the St. Louis Quarrymen's Association Mr. E. E. Quenon of the United States Bureau of Mines advised those present of preliminary arrangements which had been made for a five weeks course in first aid with particular reference to the prevention of accidents. The course is expected to start about March 15 and will be participated in by ten local quarries.

Under the present plan work will stop one hour earlier each day of the week and quarry and office employees will be brought together for instruction. When one hundred per cent of the employees of a given plant have received the instruction, the quarry is given a "Plant Certificate." Two quarries will receive instruction each day during the week which will complete the schedule in five successive weeks.

Mr. H. E. Billman and Mr. Walter Skrainka were re-elected President and Vice-President respectively for the ensuing year. Mr. Frank Webb was made Secretary-Treasurer and Col. E. J. McMahon was continued as Executive Secretary.

A Message from President Worthen

◆ In which he directs attention to the need for increasing our research work and for the establishment of more positive means for assisting our members in the prevention of accidents.

YOUR recently elected President welcomes the opportunity which the *Journal* affords, of expressing to the members of the National Crushed Stone Association his profound appreciation of the honor which has been conferred upon him. May he here pledge his earnest endeavor, and that of the other officers, to further the interests of the Association and to keep you informed from time to time, through the pages of this *Journal*, as to the progress and result of their efforts.

The loyalty of members, both active and associate, has made possible our progress in the past. Faith in an ideal during our early years, and confidence secured by success later, has enabled us to overcome obstacles which seemed insurmountable.

Under the able leadership of President Wise, our Association has grown in membership and increased its income, thus enabling the Bureau of Engineering to perform a valuable service for the industry. In his report at St. Louis, President Wise laid particular emphasis upon two things which are of extreme importance to the Association. He stressed the need of expanding our research activities and a more vigorous campaign in the interest of accident prevention.

Mr. Goldbeck, Director of the Bureau of Engineering, has for many years concerned himself with the testing of materials, and is a recognized authority in the field wherein our research work would naturally lie. Are we taking fullest advantage of the potential possibilities of Mr. Goldbeck and the Bureau of Engineering? In his annual report at St. Louis, Mr. Goldbeck made this statement: "The amount of research work thus far accomplished is a mere fraction of that which should be undertaken within the crushed stone industry."

In this age of advertising, the crushed stone industry spends practically nothing for publicity or other means of promoting sales. How, then, are we to acquaint the user of our product with its quality as an aggregate? Our sole competition is not, as many believe, other producers of crushed stone who serve the same market. The competition of all other available aggregates which may be used in place of commercially produced crushed stone is our most serious problem today.

We should constantly investigate new uses for our product. We should keep informed as to contemplated changes in standards and specifications, and seek the opportunity to discuss the need or advisability of changes before they are made.

At the request of the Board of Directors, Mr. Goldbeck submitted a tentative outline of various research problems which should be investigated, and estimated that an additional $10,000 would be needed this year.

Our present income is not sufficient to furnish the Bureau of Engineering with the necessary personnel to carry on additional work and allow Mr. Goldbeck any time to answer the calls of our membership for personal assistance on particular local problems. We must be aroused to the seriousness of the situation and furnish the necessary additional laboratory facilities which will allow us to pursue the research work necessary to expand the market for our product.

Another problem, not so vital to the industry, but nevertheless important, is that of preventing accidents. It is our hope that we may this year present to the Association a definite plan whereby we may offer to our members some assistance in organizing their accident prevention work. As an industry we realize the importance of avoiding accidents, both from the humanitarian and financial standpoints. Untold suffering is experienced by our employees and their families, and great financial loss to the industry is incurred each year as the result of industrial accidents. Many of our member companies have already made enviable progress in the reduction of accidents, and we hope to suggest a plan by means of which the entire industry will be encouraged to make greater effort toward the prevention of accidents.

In submitting these two problems for your consideration, the Board of Directors and your President earnestly request that they have your sympathetic consideration and your loyal and generous support.

The progress which the Association will make during the present year will depend to a large extent upon the measure of active and enthusiastic support extended the officers by the membership. The exceptional loyalty and active interest of your Board of Directors has long been recognized and will without question be continued. There are a number of problems which will no doubt arise, however, regarding which the general membership can be of decided assistance and your suggestions or criticisms will at all times be gladly received. The work of our standing committees constitutes a vital and important part of our activities and it is earnestly hoped and confidently believed that these committees will undertake to solve the problems which come before them with the realization that they are contributing a very real service to our Association.

Business Cooperation[1]

By DR. JULIUS KLEIN
Assistant Secretary of Commerce

◆ In times of economic stress "Business Cooperation" becomes increasingly important in Dr. Klein's opinion. "When you are out in mid-Atlantic in a bad storm, do you see anybody shoving off from the big liner in a row boat by himself to save passage money?" To resign membership in your trade association with the idea of supposedly saving money Dr. Klein characterizes as "wasteful squandering of that invaluable asset of teamwork."

I suppose it is true that, if Robinson Crusoe had been an American, the first thing he would have done, just as soon as "Man Friday" ambled on the scene, would have been to organize a booster club or trade association. It would not have been a bad idea at that. To a greater extent than most of us realize, each of us is deeply indebted to organizations of business men. I shall give you some good examples of that in a minute. Do not think for a moment that their work concerns only their paid officials or the financial interests of the companies in their membership. Not at all! Those organizations mean much to you and me, in nearly every practical aspect of our lives.

Business Organizations Have Far Reaching Effect

Here is an example: Possibly you saw in the papers the other day that many of the prominent trade associations are keeping a sharp eye on the problem of unemployment in the ranks of their member firms and are doing valuable work in keeping men on the job in their respective industries. I need hardly say how extremely valuable such activity is right now. Still another illustration of how the work of such associations brings advantages and savings to every one of us as consumers: Their pooling of patents—sharing valuable new inventions among their associates—means an immense spread of the benefits derived from new devices, giving vast numbers of us superior commodities at prices far lower than we would otherwise have to pay. Without your realizing it, you saved several hundred dollars on that car of yours because the National Automobile Chamber of Commerce has long maintained just such an arrangement among its members. Some associations operate testing laboratories which issue certificates of approval and safety-guarantees for appliances that might prove dangerous without such cooperative precautions.

Commercial Growth Greatly Assisted by Trade Associations

In very great measure, the commercial advance of the United States in recent years is directly due to organizations like chambers of commerce and trade associations. What would be your guess as to the number of such organizations in this country? The truth is, the figures are astoundingly high. There are more than 2,000 national trade bodies, about the same number of State organizations, and about 13,000 local business groups—a good 17,000 in all.

The local bodies such as chambers of commerce are doing splendid work—their service is eminently practical and tremendously helpful—and they deserve the steady, hearty support of their respective business communities. It is solely because of the factor of limited time that I shall speak this evening not so much about these admirable local groups as about the trade associations, whose activities cover a somewhat broader field.

The old-time crabbed, suspicious merchant or manufacturer who waged lone-handed guerilla warfare would, I think, be overcome with amazement if he could witness today the candid interchange of opinion (even to "ledger experience"—once the sacred, innermost secret of the merchant), the manifest present willingness to submerge petty self-interest in the common welfare.

Resignation a False Economy

I hear some members of business bodies talking, these days, about the possibility of resigning from the organization, with the object mainly of supposedly saving money. I can think of nothing more dangerously extravagant than that—a wasteful squandering of that invaluable asset of good teamwork at the very time when collaboration is absolutely vital. When you are out in mid-Atlantic in a bad storm, do you see anybody shoving off from the big liner in a row boat by himself to save passage-money? Well, hardly!

I believe that the titanic developments of modern business have made sturdy commercial organizations practically indispensable. The requirements of commercial life are too stringent now—the problems are too far-reaching and too intricate—to be grappled with effectively by any single firm, however courageous or self-confident it may be. Mass action is imperative—and mass assaults can move mountains.

Of course, not all such associations are perfect, by

[1] A radio talk delivered over the coast-to-coast network of the Columbia Broadcasting System from Washington, D. C., February 6, 1931.

any means. Human frailties insist on cropping up here and there. There is no use denying that certain doubtful, or devious, or plainly malevolent, phases do manage occasionally to creep into the work of a trade association. But here is the thing to bear in mind: One brick employed as a missile in a riot is no reason for declaring all bricks deadly weapons. The vast majority of them are used for constructive purposes.

The Department of Commerce works in cooperation with more than 60 committees representing hundreds of trade associations. Thus we enjoy the immense advantage of treating with a unified, responsible body, authorized and competent to voice the needs and express the viewpoints of an industry as a whole. If we had to thresh out every question with all the individual units in an industry, the task would be, in most cases, gigantic and almost endless.

Research Activities of Vital Importance

The strength that springs from union is nowhere more apparent than in the research activities of trade associations. Technical and market research, in these days, is apt to be expensive—often so extremely costly that a single firm, unless it be very opulent, could not dream of defraying the expense of procuring the vital facts it needs. But the pooling of such expense by dozens or hundreds of firms—the results to be made available to all alike—puts a totally different complexion on the matter.

And this is precisely what is done through most trade associations. Cooperative research by such associations takes a variety of forms. There is, for instance, the collection of statistics—figures which give the industry a clear idea of its position—absolutely indispensable at this confused juncture of our business history. Then there is research of a strictly scientific character—discovering new principles, new applications of natural laws, through which an entire industry may reduce costs, increase efficiency, strengthen sales-appeal, or develop new uses for its products. Can anything be more vital to industry in these days of sudden, even dramatic change in buying habits, living conditions, etc.?

"Simplified Practice" Made Possible by Trade Associations

Here are still other examples of the countless ways in which the work of such organizations affects you and me. We all use Turkish towels (or ought to). How many varieties of these—not designs, of course, but grades and sizes—do you think there used to be? No fewer than 74—but now they have been reduced to 6, through the cooperation of the interested trade association, namely, the Cotton-Textile Institute, and the Department of Commerce, because there was practically no demand for the remaining 68 varieties, though you and I had to pay for making and keeping them in stock. We all handle tin cans very frequently; the newspaper funny men accuse Mrs. Newlywed of living out of them, or in them, or something of the sort. Until just recently she had to accustom her dainty fingers to hundreds of different varieties of such cans, but now the number has been cut to 27, through the cooperation of the National Canners' Association. Thus money has been saved for retailers and for the consuming public. The success of that splendid movement which we know as "simplified practice"—meaning the collective effort of an industry to reduce waste in the production and distribution of its products, through eliminating unnecessary varieties in sizes, dimensions, grades, or qualities—has been made possible *only* by trade associations. You simply could not bring about such extensive revisions of old-established practices without concerted, well-directed drives.

Really remarkable results have been achieved through *cooperative advertising* by trade associations. Such associations spend each year more than 10 million dollars on institutional or group-trade advertising. Some exceedingly profitable slogans and ideas have been popularized that way. And, through such activity, industries have been made alive to the possibilities of *creating business* rather than merely "swapping customers."

There can be a great protective or restorative value in such advertising. Here are one or two examples of what I mean by that: Some time ago, just after we had had such extensive publicity on pure-food legislation, the canners of food products were faced with the problem of restoring public confidence in canned goods. The findings of intensive laboratory research by their association formed the basis of a most successful appeal to the common sense of the consumer.

Service Rendered Covers Wide Range

We discover associations making energetic efforts to prevent bankruptcies among their members—getting together with the object of "tiding over" a shaky brother, even if that involves stepping in and running his plant for a while. They give impartial information to an outsider who is thinking of entering their chosen field, so as to direct his prospective enterprise into profitable channels. We witness their cooperation with Better Business Bureaus throughout the land in the determination to combat fraud. They labor collectively in the cause of accident-prevention.

American trade associations extend all kinds of help and counsel to visiting commercial delegations from abroad—as in the case of the recent International Road Congress. They have motion pictures produced to explain the workings of a given industry—or they publish magazines or issue attractive, useful handbooks for a like purpose. They provide unified action for their industry in handling traffic cases, questions of freight rates and so on. Many credit matters, too, now come within the sphere of the trade associations.

(*Continued on page* 28)

Some Legal Aspects of Proration[1]

By HAROLD WILLIAMS
Member of the Boston Bar

◆ What is the solution for over-production and indiscriminate competition in the crushed stone industry? Can the principle of proration be legally applied? In the following article Mr. Williams calls attention to the various legal aspects of this problem which should be of distinct interest to the industry.

PRORATION is the answer of the crude oil industry to the menace of overproduction. Overproduction in this country today has brought in its train destructive competition, ruinous price depression, and for the time at least, serious economic disorganization. Where salesmanship can no longer create or even sustain demand, the only alternative is to decrease supply. Any scheme to diminish industrial output must divide the burden of contraction proportionately. The crude oil industry, a conspicuous victim of present day conditions, has to a large extent accomplished systematic reduction of supply. This industry has many features peculiar to itself, but there is much of interest, if not of application to other industries in what the oil business has done by way of proration.

Limiting Output by Proration

Oil production is highly individualistic and competitive. There is no property in oil until it is reduced to possession, and so when oil is discovered in an area every landowner must hasten to get out as much oil as he can for himself before his neighbors get in ahead of him. Drilling thus becomes a race in which no attention can be paid to market requirements, and overproduction is an almost certain consequence.

Indiscriminate competition in drilling not only results in economic waste from production in excess of demand, but also in appalling physical waste through loss of natural gas and consequent low percentage of oil recovery. Recently in California $10,000,000 worth of natural gas was lost in taking out $5,000,000 worth of oil and gas products. Restriction of the output of oil in the larger oil fields or pools has therefore become an urgent measure of public policy for the conservation of a natural resource.

In 1924, President Coolidge, by executive order, created the Federal Oil Conservation Board with the Secretary of the Interior as Chairman. With the aid of the American Petroleum Institute and a voluntary committee of five, the Oil Conservation Board has periodically published information as to probable future demand, estimated necessary production, and reasonable allocation of requirements between the larger producing states. The last such report was released November 8th, calling for a further reduction of output and recommending a schedule of proration. Texas, California, Oklahoma and other great oil states have accepted this recommendation and in turn have further prorated their respective allocations among their own areas through local commissions and producers' associations.

Proration within the states has been brought about under state conservation statutes, the conservation of the natural resources of a state being peculiarly a matter of the sovereign police power of the states. Under the various state statutes elaborate systems of regulation have been evolved and it may fairly be said that proration in the oil industry is an accomplished fact.

Can Proration be Applied to Other Industries

We have therefore in full operation with the approval of Federal and State Governmental authority and the cooperation of the business itself, a well organized system limiting the output of a necessary raw material. It becomes of interest to consider how far all this is legal, and if it can be done in the oil industry, to what extent would similar arrangements be lawful in other industries, as for instance, in the production of crushed stone.

It may be that the crushed stone business could never agree upon a schedule for cutting down the supply to save the price. It is probable also that no state would attempt to regulate stone production by law, and that the industry would protest against any such attempt if it were made. And yet it is of general interest at least, for those engaged in any branch of raw material production, to consider whether cooperative measures of this kind can safely and legally be adopted if necessity for them should arise.

Limiting Production—Conservation of Natural Resources

There are two main legal problems. First, how far can a state limit the production of raw materials on the theory of conservation of natural resources, and not come into conflict with the constitutional prohibitions against taking private property without due process of law, and denial of the equal protection of the law.

[1] Presented at the Fourteenth Annual Convention of the National Crushed Stone Association, Hotel Jefferson, St. Louis, Mo., January 19-22, 1931.

Very recently, state conservation laws have been held constitutional in Oklahoma and California, and systematic proration carried on under them upheld. In Oklahoma, the statute includes under the head of forbidden waste:

> "Production in excess of transportation or market facilities or reasonable market demands."

The Supreme Court of Oklahoma said that oil is wasted or lost in storage above ground and consequently production beyond market requirements leads to physical waste and can lawfully be prevented by proration. There was a vigorous dissenting opinion to the effect that what the statute really aimed at was not protection of a natural resource in the public interest, but preservation of the private interests of industry by stabilizing the price of its products. The decision does not, of course, go as far as that, but it does distinctly approach the proposition that preservation of an industrial structure may be a legitimate matter of public concern, and that incidental stabilization or even increase in prices does not make it unconstitutional. This decision, which we are told is not to be taken to the United States Supreme Court, stands as the foremost expression of liberal and constructive judicial thought on this topic.

The Federal Courts have not yet directly dealt with state proration statutes, but cases are pending in the United States Courts in Texas and Oklahoma which will probably find their way to the United States Supreme Court. Until that tribunal deals with the subject, it seems likely that oil proration will continue to exist under the protection of state conservation laws.

Limiting Production—Agreement Within Industry

The second and much more important legal problem concerns agreements and understandings within the industry to bring about proration. How far is it legal for associations or business groups to make agreements to limit production of a necessary raw material? Production is not commerce, but it may affect commerce. The Federal anti-trust laws forbid unreasonable restraint of interstate commerce. Certain sorts of agreements such as those fixing prices are held contrary to law, whether in fact the prices agreed on are reasonable or not. Agreements to restrict output would probably be considered illegal even though reasonable, unless they were justified strictly as conservation measures which affected or limited interstate commerce merely as an incident. Even contracts among adjoining owners of oil land for unit operation of oil pools were regarded by the Federal Oil Conservation Board and a committee of the American Bar Association investigating the subject for them as of such doubtful nature that specific legislation was recommended to exempt them from the operation of the anti-trust laws.

Economic Conservation Not Sufficient Basis for Legislation

Obviously, therefore, it is extremely doubtful whether concerted curtailment of output can safely be carried on under the guise of conservation, with the anti-trust laws as they are today. Physical conservation of natural resources has long been recognized as of such importance to the public as to justify legislation regarding it. Economic conservation of industrial organization has not yet come to be so considered, and unless a disturbance of the mechanism of business can be shown to result directly in physical waste of a natural resource, as was found in the Oklahoma case, there is no recognized basis for legislation. In any business such as the production of crushed stone, it would presumably be difficult to establish the fact that overproduction, however disastrous economically, tends to produce actual physical waste. The extent, if any, to which crushed stone piled on the surface of the ground is subject to deterioration or shrinkage, is a matter which you yourselves are best qualified to determine. Probably, too, the potential supply of crushed stone is so vast that there is no practical need of measures to conserve it.

It would therefore seem unsafe to rely on the doctrine of conservation as a sound basis for economic relief. And this conclusion is emphasized by the language of the Supreme Court of the United States in its latest opinion on the Sherman Act, in which it is said that:

> "In order to establish violation of the Sherman Anti-Trust Act, it is not necessary to show that the challenged arrangement suppresses all competition between the parties or that the parties themselves are discontented with the arrangement. The interest of the public in the preservation of competition is the primary consideration. The prohibitions of the statute cannot be evaded by good motives. The law is its own measure of right and wrong, of what it permits, or forbids, and the judgment of the courts cannot be set up against it in a supposed accommodation of its policy with the good intention of parties, and it may be, of some good results."

The United States Supreme Court stands as it must stand for rigid adherence to the statute law, and if the policy of the Government toward cooperative arrangements is to be relaxed, any such leniency must come from a change by Congress in the anti-trust laws.

Possibilities of Amending Anti-Trust Laws

In discussing any amendment of the law, it would be wiser not to rely upon the doubtful protection of the principle of conservation, but to advocate frankly the recognition in our statute law of the growing senti-

ment that there is a public interest in the preservation of those complex industrial structures that are the greatest expression of our national genius; a public interest outweighing in permanent common advantage any temporary benefit to be derived from the opportunity of buying in markets shattered by abnormal competition.

As the Federal Oil Conservation Board has aptly put it:

> "The interdependence of American industry and commerce is a recognized and inherent incident of our whole economic structure . . . A serious maladjustment of one of these great industries must react upon the others. Then the depression in the outstanding industries influences a similar condition throughout the industrial and commercial life of the nation."

President Hoover in his message to Congress on December 3rd, said:

> "The people have a vital interest in the conservation of their natural resources; in the prevention of wasteful practices; in conditions of *destructive competition, which may impoverish the producer and the wage-earner*; and they have an equal interest in maintaining adequate competition. I therefore suggest that an inquiry be directed, especially to the effect of the workings of the anti-trust laws in these particular fields to determine if these evils can be remedied without sacrifice of the fundamental purpose of these laws."

Representative Graham of Pennsylvania has given notice that a resolution will be introduced in Congress providing for a congressional inquiry in accordance with the President's suggestion, and it seems almost certain that the entire subject will be considered by the present Congress.

If any wide and inclusive measure of relief is to result, it should not be confined within the comparatively narrow scope of conservation of natural resources, but should be based upon the broader principle that there is no constitutional right to buy below cost; that the immense aggregations of capital invested in organized business have a right to the fair and reasonable return without which business cannot continue to exist; that the people both as wage-earners and consumers are vitally concerned in the stabilization of industrial conditions; and therefore that legitimate industry should be entitled to take reasonable cooperative steps to protect itself from the evils of excessive competition in times of extreme overproduction.

Important Factors in Effecting Legislative Relief

The exact form which such legislative relief should assume is a question which calls for deep study and thought on the part of those charged with the responsibility of enacting it. It has been suggested that some sort of industrial tribunal should be created with authority to pass upon and sanction agreements of this character, where the rights of the public were not invaded. It would be presumptuous to attempt here to prescribe or define a remedy, but it may not be impertinent to touch upon some of the general principles which should enter into any consideration of the question. In considering any amendment to the anti-trust laws, it must constantly be borne in mind that the people as a whole have a vital interest in agreements affecting or limiting free competition and that if such agreements are to be made permissible, they will have to be subject to some degree of governmental regulation and control. There is always the danger that the price of governmental aid may be governmental intrusion and supervision. There is, on the other hand, a healthy tendency to allow business to regulate itself, such as is manifested by the attitude of the Federal Trade Commission toward the trade associations, which we had opportunity to observe at the Trade Practice Conference last year in Cincinnati.

Action within the industry must of course be voluntary and without suspicion of any coercion, and voluntary cooperative action in most industries is extremely hard to achieve, except where conditions are grave enough to bring about an almost unanimous sentiment. This circumstance alone would operate to protect the public from any harmful combination to restrain competition unduly, and would automatically limit concerted effort by any industry to defensive measures of protection in times of stress.

All this may appear to be of no immediate concern to the crushed stone industry which has its own unique problems, but the time may come when it might be desirable to combine not to raise prices, but to uphold them above the level of disaster. Should Congress act at all, it is essential that its action shall be comprehensive enough to include all raw material production. If industry is to be given greater latitude, then to insure the minimum of official intervention, such self regulation within the industry must be broad-gauged enough to recognize that the welfare of business is in the long run identical with the welfare of the whole consuming public, upon which the success of business depends.

Any amendment to the anti-trust laws should therefore be permissive in its nature, and leaving the initiative to the councils of business where it properly belongs, and reserving to the agencies of government the necessary function of approval and veto. Legislation along such lines would constitute the Federal Government an aid rather than a check upon legitimate business enterprise.

Rates and Rate Making[1]

By EDWIN BROOKER,
Commerce Counsel
Washington, D. C.

◆ Mr. Brooker very clearly shows that crushed stone is an article of commerce which is a very desirable commodity from a transportation viewpoint. He points out the important necessity of all producers' cooperating to see that just and reasonable rates are established. The problem, Mr. Brooker feels, is by no means a local one as dangerous precedents are frequently established locally which have far-reaching and harmful effects on rates in other localities.

THE subject of "Rates and Rate Making," particularly as it applies to crushed stone and related commodities, is one of great importance to the producers and consumers of such commodities.

The producers as a rule do not pay the freight charges on crushed stone, but are interested to the extent of having freight rates which will enable the commodity to move to the respective markets at just and reasonable rates and at rates which are relatively aligned with rates from competing points of origin, as oftimes reductions in selling prices are necessary to equalize delivered costs at destination.

It is the duty of shippers of crushed stone to see that the consumers do not have to pay more than just and reasonable rates and to that end, should cooperate to see that proper levels are established and applied.

Crushed stone represents an article of commerce which is a very desirable commodity from a transportation viewpoint as I shall attempt to show.

Main Factors in Determining Rates

In making rates on any traffic there are certain fundamental transportation factors which must be taken into consideration. These are as follows:

(1) Nature and value of the commodity as it affects carriers' risk in handling and what the traffic will bear.
(2) Susceptibility to loss or damage in transit as it affects carriers' risk and liability in handling.
(3) Average loading of the commodity.
(4) Volume of the traffic.

These are the main factors to be considered in the question of just and reasonable rates. There are others of incidental importance which I will not discuss in detail.

Crushed Stone is Desirable Traffic

Crushed stone is representative of a group of commodities which includes sand, gravel, slag, etc. It is one of the lowest valued commodities offered to the carriers for transportation and cannot move except at low rates, because freight rates in numerous cases exceed the value of the commodity F.O.B. shipping point.

Crushed stone is transported almost exclusively in open top cars and not subject to damage in transit by any of the elements or by rough handling and the only claims for loss occur in the case of defective equipment or in case of wreck. Claims for loss or damage on crushed stone and related commodities are so negligible that they have not even been given a separate classification in the claim records of the railroads.

From the standpoint of value therefore, as it affects risk and liability in transportation and carriers' costs of handling, it is a very desirable traffic.

Crushed Stone Is a Heavy Loading Commodity

Another important factor is that it is a heavy loading commodity, the average being in excess of the marked capacity of the car and generally exceeding 55 tons per car.

While rates on crushed stone are generally on a per ton basis, yet the car is the unit of transportation.

The car is the unit of all switching and terminal movements whether empty or loaded. It is the unit for all billing and accounting records. It is the unit on which interest on investment, taxes, depreciation, repairs and per diem charges are computed and allocated to carriers' costs.

If all of these costs are allocated to a car of crushed stone for the time it is in such service for an individual movement and distributed among 55 tons, it is very apparent that the cost per ton is much lower than on lighter loading commodities.

In making up a train, the tare weight of a car as compared with the net weight of the loaded commodity is also an important item. Each locomotive is rated to haul a certain number of tons over the different divisions of a railroad on which it is used.

Take for example an engine with a rating of 1500 tons can handle 20 carloads of crushed stone consist-

[1] Presented at the Fourteenth Annual Convention of the National Crushed Stone Association, Hotel Jefferson, St. Louis, Mo., January 19-22, 1931.

ing of 1100 tons of revenue paying freight and only 400 tons of dead weight, representing the tare weight of the cars, at an average of 20 tons per car. To make up a trainload of a commodity averaging only 20 tons per car, it would require 37.5 or 38 cars, of which there would be only 750 tons of revenue freight and 750 tons of dead weight.

Compare the use of 20 cars in a train of crushed stone with the use of 38 cars in connection with the handling of a commodity with an average loading of 20 tons.

Compare a distribution of train costs to 1100 tons of crushed stone with only 750 tons of a commodity loading 20 tons to make up a trainload.

Similar comparisons which reflect a relatively low tare weight per car as compared with the load can also be made.

When it comes to allocating the costs for switching, terminal and weighing services, for billing and maintaining accounting records, for repairs, per diem, depreciation of equipment, taxes, interest on investment, etc., you will find these costs are the same on a car whether loaded with crushed stone or loaded with a lighter loading commodity. The average cost per ton on a car loaded with 55 tons of crushed stone, must therefore, be lower than on a car loaded with only 20 tons of some other commodity.

The weight loaded into a car is an important factor in reducing the handling costs per ton and crushed stone being one of the heaviest loading commodities transported by the railroads, is entitled to the lowest rates per ton from an average loading standpoint.

Volume of Movement Is Important Factor

The volume of movement from individual plants is also an important factor.

Picture the switching and terminal service at a plant where 10, 15 or 20 cars are placed and loaded daily, compared with like service at an industry using but one or two cars per day. Those who are actually engaged around the plants know that the service of placing or picking up five or more cars in a single movement is no greater than where the service is performed on one or two cars.

The costs of handling crushed stone per car because of the volume of movement, must be lower than on traffic represented by commodities of less volume.

We have lower cost per car because of volume, followed by lower costs per ton because of heavy loading, on a commodity of extremely low value, in connection with which the carriers have no risk or assume no liability in handling.

Crushed stone requires no special or expedited service. It provides a quick turnover of equipment because of methods used in loading and unloading and in numerous cases utilizes equipment which otherwise would move empty in the direction of coal mines.

Entitled to Low Rates Per Ton

Taking these transportation conditions into consideration and the same would apply to sand, gravel and slag, we have in crushed stone, a very desirable traffic and one which is entitled to relatively low rates per ton.

The situation as it exists can best be expressed by a statement of a railroad superintendent some years back when he said that he would rather have a crushed stone or sand and gravel plant on his railroad than several other smaller industries shipping higher grade traffic.

This is because crushed stone, etc., requires a lesser service at lower costs in proportion to the revenue received than other traffic.

Sixth Class traffic at a rate of 15 cents per 100 lbs. or $3.00 per ton for a distance of 100 miles, only pays the railroads minimum revenues of $60.00 per car for both single and joint line movements, whereas crushed stone and sand and gravel in the Southwest, Southeast and in some parts of the Eastern district, will provide revenues of $55.00 per car for the same distance at a rate of $1.00 per ton for single line hauls and greater revenues for joint line hauls.

It can therefore readily be seen, that with approximately the same revenues per car as on Sixth Class traffic and the lower relative costs per car on crushed stone, that the latter commodity returns a greater net revenue per car and is a very desirable traffic at the present rate levels.

High Net Revenue Per Car Should Be Stressed

This information should be stressed by shippers in their negotiations with the carriers and in all proceedings, where the rates on crushed stone and related commodities are involved, in order to dispel the oft expressed idea that it is not a desirable traffic from a revenue producing standpoint.

I have always been a staunch advocate that shippers are entitled to just and reasonable rates and at the same time have never advocated any proposition which I considered unfair from a carrier's standpoint.

In addition to considering the transportation factors I have mentioned, it is customary in individual instances to consider the general level of rates, in the same or contiguous territory on the same or like commodities, as a guide for a reasonable level of rates. Comparisons are also made with rates on the same or like commodities in other parts of the same district or territory or with rates in other territories.

Tendency to Establish Rates on Uniform Basis

The tendency today, as it has been in the past few years, is towards the establishment of rate levels on crushed stone and related commodities on a uniform basis.

Except in a few spotted sections of the United States where competitive point to point rates have been established or prescribed, such as between Indiana and Illinois and from such territory to Michigan points, the general tendency is to establish maximum mileage scales to be used as a guide in the publishing of rates.

Thus in Southeastern territory which includes the territory east of the Mississippi River and south of the Ohio and Potomac Rivers, there has been prescribed a general maximum scale of rates on sand, gravel, crushed stone, slag and related commodities.

In Southwestern territory similar action has been taken.

In the Western States we have maximum mileage scales laid down as precedents in the Clay County Crushed Rock Co. and the McGrath Sand and Gravel Co. cases, which set the general basis for that territory.

In the Eastern district we have a hodge podge adjustment commencing with the Buckland scale in the Atlantic Seaboard territory, the West Penn scale on a slightly lower basis in the Pittsburgh area, and lower rates either on a mileage or specific point to point basis west thereof.

Cooperation Lacking in Eastern District

There has been in the Eastern District, no cooperation or unity of action among shippers of crushed stone, sand, gravel or slag, either as between shippers in any one individual group or as between all shippers of these commodities as a whole. It is in the territory Pittsburgh and east, where the rates have always been on an exceedingly high level, that the greatest difficulty has occurred in having a reasonable basis established.

There is not a shipper in this room, who has been involved in rate litigation in recent years who has not been confronted with the level of the Pennsylvania sand and gravel scale, sometimes called the Penn scale and which I refer to as the West Penn or Docket 15329 scale.

That particular scale when prescribed, had the effect of reducing the carriers' revenues in the territory involved approximately $700,000 per year. This is referred to, merely to show you the extent of the reductions involved in that territory.

It was considered a big victory by shippers when that scale was prescribed in that territory and yet I must apologize to shippers everywhere for the handling of that litigation.

Following the establishment of the West Penn Scale, slag interests in trunk line territory east of Harrisburg, Pa., were involved in proceedings which netted them a higher scale known as the Buckland Scale, and which I claim was prescribed either based on erroneous or insufficient evidence or else a mistaken idea of the actual application of the West Penn Scale.

I am now engaged in handling a general slag case and also a sand and gravel case from one shipping point in that territory in which I am hopeful of wiping the Buckland Scale out of existence.

Remember, the Eastern District is a territory where precedents have been established on other traffic, making it the lowest rated territory of any in the United States, because of traffic density and favorable operating conditions.

When any scale is established on any traffic in the Eastern District which is east of the Mississippi River, on the same or higher level than in the West, Southwest and Southeast, it is religiously used as the railroads' Bible in their claims for higher rates in such other territories, because it has always been a precedent that rates in the West, Southwest and Southeast should be on a higher basis than in the Eastern District.

West Penn Scale Barrier to Lower Rates in Eastern District

The West Penn Scale stands out as a barrier to the securing of a lower level of rates east thereof in the two cases I am now handling in that territory and the Commission is disposed to look upon it as a central territory scale.

As long as that scale remains unchallenged before the Interstate Commerce Commission, it will act as a barrier to the proper relief in the Eastern District and it will likewise affect in future litigation, as it has in the past, the securing of a proper level of rates in other territories. That explains the reason for my apology, irrespective of the feeling of the shippers in that territory, that results secured were more than satisfactory.

The Commission in the McGrath Case—165 I. C. C. 461, said:

> "From the standpoint of what we believe to be relative transportation conditions, there has undoubtedly been an inconsistency between our decisions with respect to rates on sand and gravel in Southern and Southwestern territories and our decisions with respect to corresponding rates in official territory."

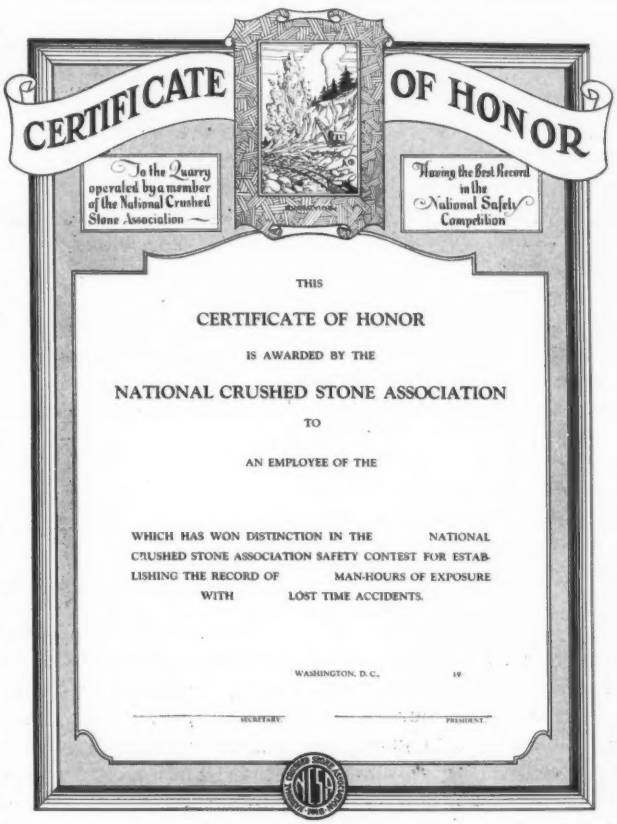
The Commission prescribed a higher scale in the McGrath Case than in the Southwest.

(*Continued on page* 26)

« « EDITORIAL » »

Accident Prevention Always Pays

IT is perhaps not a common belief, but one nevertheless shared by many in the industry, that an accident prevention campaign is engaged in largely because of humanitarian reasons. That such is a motivating influence cannot be questioned, but what is less clearly seen is the fact that accident prevention pays dividends which are translatable into a real dollars and cents value. A properly conducted accident prevention campaign always pays a handsome return and is not, as many other investments are, subject to changing economic conditions or business depressions. As a positive means for increasing profits accident prevention offers an unusual opportunity to crushed stone producers. An examination of the records of past years in this field reveals the surprising information that many instances actually exist where accident prevention work efficiently conducted has spelled the difference between profit and loss, and in some cases has materially assisted in preventing concerns from going bankrupt. Confronted by the business situation of today, it would clearly seem to be the course of wisdom for our members to give more serious consideration to the excellent opportunities offered to them for decreasing the cost of production by means of properly organized and enthusiastically promoted accident prevention campaigns. W. H. Cameron, Managing Director of the National Safety Council, has very aptly said, "Waste in production cannot be justified in a business which would survive—and accidents are a waste from which there is no salvage! Curtailment of accident prevention is false economy."


CERTIFICATE OF HONOR

To the Quarry operated by a member of the National Crushed Stone Association

Having the best record in the National Safety Competition

THIS

CERTIFICATE OF HONOR

IS AWARDED BY THE

NATIONAL CRUSHED STONE ASSOCIATION

TO

AN EMPLOYEE OF THE

WHICH HAS WON DISTINCTION IN THE NATIONAL CRUSHED STONE ASSOCIATION SAFETY CONTEST FOR ESTABLISHING THE RECORD OF MAN-HOURS OF EXPOSURE WITH LOST TIME ACCIDENTS.

WASHINGTON, D.C., 19

SECRETARY PRESIDENT

Presented to each employee of each plant completing the year with no lost-time accidents

The officers and directors of the National Crushed Stone Association have been aware for some time of the extreme desirability of awakening in the minds of those engaged in the industry a more enthusiastic interest in safety work, at the same time realizing that there are many of our members very keenly aware of the excellent returns to be obtained from this activity. At each convention for the last few years a section of the program has been set aside and specifically devoted to the subject of accident prevention and at the annual meeting just concluded in January we were privileged to hear a paper of outstanding interest by Mr. Thos. J. Quigley, Chief, Mines and Quarries Section, Department of Labor and Industry, Pennsylvania, in which he suggested that the National Crushed Stone Association might to its very real advantage much more actively promote safety work. Mr. Quigley's suggestions made a deep impression upon those attending the convention as reflected by subsequent action taken at the meeting of the Board of Directors held immediately following the annual convention. At that meeting, "It was moved by Mr. Graves, properly seconded and carried, that the Executive Committee be instructed to investigate a feasible plan for accident prevention work for the Association to undertake for the benefit of its members along the lines indicated by Mr. Quigley, and to report to the next meeting of the Board of Directors whether or not a feasible plan could be devised and what would be the cost." A detailed report will be made by the Executive Committee at the mid-summer meeting of the Board held the latter part of July, but in the meantime there is much which the individual members of the Association can do to decrease the number of accidents which take their annual toll from our industry.

Safety contests have long been recognized as an excellent medium for stimulating interest in this most

important work and in 1926 there was established the National Crushed Stone Associaion Safety Contest. This contest is held between the members of the National Crushed Stone Association who enter the National Safety Competition sponsored by *The Explosives Engineer* and held under the supervision of the United States Bureau of Mines. By conducting the contest in this manner, the Association is relieved of the burden of collecting and compiling the necessary statistical information which would entail considerable financial outlay which the budget is not at present able to carry, and at the same time enjoys the advantage of accumulating a record of the accidents which are frequent in our industry. As the years go on this information becomes increasingly valuable and those companies which each year enter the contest are rendering a real service to the industry of which they are a part.

To the company winning the contest there is awarded for the period of a year *The Explosives Engineer* Award, a bronze plaque of the quarry panel of the National Safety Competition trophy, "Sentinels of Safety." During the first year of the contest (1926) it developed that two plants completed the year with no lost-time accidents and it therefore became necessary to establish as the winner the plant having the greater number of man-hours of exposure, and this method of selecting the winner has been continued up to the present time. In 1927 there were three plants which completed the year with no lost-time accidents; in 1928 five plants and in 1929, the last year for which records are available, six plants. From two plants making perfect records in 1926 to six plants making perfect records in 1929 is an excellent accomplishment and shows without doubt that the safety contest has a real usefulness in the field of accident prevention.

It is true that each company making a perfect record is given honorable mention and awarded a parchment reproduction of *The Explosives Engineer* Award, and yet, it seemed advisable, to further encourage our member companies to enter this contest, to give recognition to the various employees of the companies establishing perfect records. Consequently the Association now gives to each employee of every company making a perfect record a certificate of award, a reproduction of which is given on the preceding page. In the 1929 contest, the first year for which the certificates were given, a total of 328 were awarded to the various employees of the companies making perfect records, and the enthusiasm with which the certificates were received was a gratifying indication of the interest which the men themselves take in safety contests.

Although there is a restriction placed upon the size of quarries eligible to enter the National Safety Competition, no such restriction exists as regards the National Crushed Stone Association Safety Contest. Every member company of the Association should therefore enter its various plants in the Association contest. To do so only requires that the Bureau of Mines be advised of your intention to enter the contest and that you agree to advise the Bureau of Mines of each lost-time accident suffered by any employee of the plants entered in the contest. The forwarding of this information to the Bureau of Mines has been made as little burdensome as possible, as carbon copies of the regular forms prescribed by compensation commissions of the various states may be used in furnishing the accident data required for the contest, or should you prefer the Bureau of Mines will provide you with suitable forms.

It is not too late now to enter your plants in the competition for 1931 and we earnestly suggest that you immediately do so. The Bureau of Mines will be glad to forward upon application the necessary forms or if preferred the Washington Office of the Association will enter your plants in the contest. Even though you have suffered a lost-time accident at your plant up to the present time it is still important that you enter the contest, for though you would perhaps not win the trophy, nevertheless the statistical information which would be obtained from your plant throughout the year would be of distinct value and assistance in helping to build up the Association records as well as those of the Bureau of Mines. There has been an increasing number of plants entered in the contest each successive year since its inception and it is sincerely hoped that this year will mark a substantial increase over last year.

Rates and Rate Making

(*Continued from page* 24)

Rate Problems Are National in Scope

The point I wish to stress is this: That shippers in the same or other territories are interested either directly or indirectly in all complaints or investigations involving rates on crushed stone, sand or gravel or slag, and shippers directly involved owe it as a duty to other shippers in the same or other territories, to do everything possible to see that just and reasonable rates are prescribed as a result of such litigation, and no precedents are established which will be injurious to other interests.

It is customary to compare the relative rates, revenues and transportation factors on crushed stone for example with rates, revenues and transportation characteristics on other commodities.

I respectfully assert that crushed stone and related commodities, generally are paying more than their proper share of the revenues of the carriers in proportion to costs of handling. There are none of us who object to the carriers' receiving reasonable revenues on commodities such as crushed stone, etc., because it is necessary to efficient and effective transportation, but

there should be a proper distribution of transportation costs among the various kinds of traffic.

The general rate structure of the country is gradually undergoing a general revision and in such revisions, reductions in carriers' revenues occur. In this general revision, shippers of crushed stone and related commodities must see that their traffic is placed or continued on a proper rate level as compared with other commodities.

Investigation of Rates on "Industrial Sands"

The Commission is pursuing an investigation at the present time of rates on so-called "Industrial Sands" with the idea of arriving at a classification of sands for rate making purposes and establishing a rate level thereon. This covers the Eastern District.

The railroads have announced at that hearing, that effective on or about February 15th next, tariffs will be issued which will restrict the application of present rates on gravel, slag, crushed stone and screenings, ground limestone, agricultural limestone, fluxing limestone, dolomite, etc., to shipments in open top cars and will also establish a basis of 60% of Sixth Class rates on shipments in box cars.

This action only covers Central Territory at present, but if allowed to go into effect will in the course of time affect other territories.

Sixty per cent of Sixth Class rates at 100 miles means a rate of $1.80 per ton on box car shipments of these commodities as compared with only $1.00 under the West Penn Scale on the same commodities in open top cars.

The danger of this proposal and it applies whether you ship any of these materials or not, is that the difference in rates between open top and box car movements is so great, 80 cents per ton in the instance mentioned, that if unchallenged and permitted to go into effect, will eventually lead to an increase in open top car rates, as there is no justification for the differences contemplated and box car rates will be pointed to as a reason for such increases.

Transportation Committees

This information is given to you that you may know what is transpiring, and to raise a thought in your minds of the necessity of each association, establishing a transportation committee, consisting of shippers in each territory to consider and deliberate on matters of this kind and keep informed as to contemplated changes and litigation instituted in all parts of the country and take whatever action may be necessary to protect the association members as a whole.

There are other matters such as competition and joint line rates which I have not discussed due to lack of time assigned, but I will be glad to answer any questions pertaining thereto at this time or at any other time during the day. Thank you.

Business Cooperation

(*Continued from page* 18)

They effect important savings through joint purchases of equipment and in the determination of style trends.

The associations carry out the extremely useful policy of certified grade marking to protect the inexperienced consumer (as in lumber and tiles, for example) in cooperation with Government agencies. They introduce standard labeling, to prevent misconception on the part of buyers. They maintain standard packing and crating practices, for our convenience and protection and their own greater profit.

The National Lumber Manufacturers Association has taken an ancient and highly conservative industry and brought it into the forefront of modernism. The American Institute of Steel Construction is responsible for the general adoption of a standard building code which has helped to increase the use of steel, yet has meant an annual saving of 30 million dollars to building-owners. The National Retail Credit Men's Association advances the claim (justly, I believe) that the service conducted under its auspices has saved the merchants of this country millions of dollars formerly lost because of inaccurate and incomplete credit information, and that the extended credit made possible by this prompt and efficient exchange of credit data has materially increased the buying power of wage earners and of those with limited incomes—all making for greater comfort and happiness among our people.

Business Collaboration is Applied Common Sense

And so we may say that business collaboration is just applied common sense. The great British labor leader, John Burns, once told of visiting a lunatic asylum and of being astonished by the few keepers. "What's going to happen," he asked, "if those maniacs get together and start something?" The doctor's answer was significant: "Lunatics don't collaborate." And to that I might add: But sensible, far-sighted business men are not lunatics.

I need not emphasize how tremendously valuable such cooperative service can be right at this present juncture in our American business life. It forms a potent factor in helping to boost us along the path that leads upward to the plateau of prosperity out of the distressing trough of depression.

At the G-E Motorized Plant of the France Slag Company

A remarkable motor-control installation

Control room, France Slag Company, Toledo, Ohio

Motors that run in drifts of dust

One of the G-E totally enclosed, fan-cooled motors driving a magnet belt

ALL the control compactly arranged in one room. The entire flow sheet started and stopped in sequence at the touch of one button on the ground floor. Safety provided by emergency stop-buttons located on every floor. All the motors totally enclosed, fan-cooled—operating reliably day after day in drifts and clouds of abrasive dust.

This is the type of electrification the rock-products plant can obtain when G-E Motorized Power is selected. To specify G-E Motorized Power is to obtain: (1) the correct motor for each machine and each service condition; (2) the correct control for each motor; (3) the coördination of motors, controller, and machinery to achieve maximum production at the lowest operating cost. Information and service are always available at a nearby G-E office.

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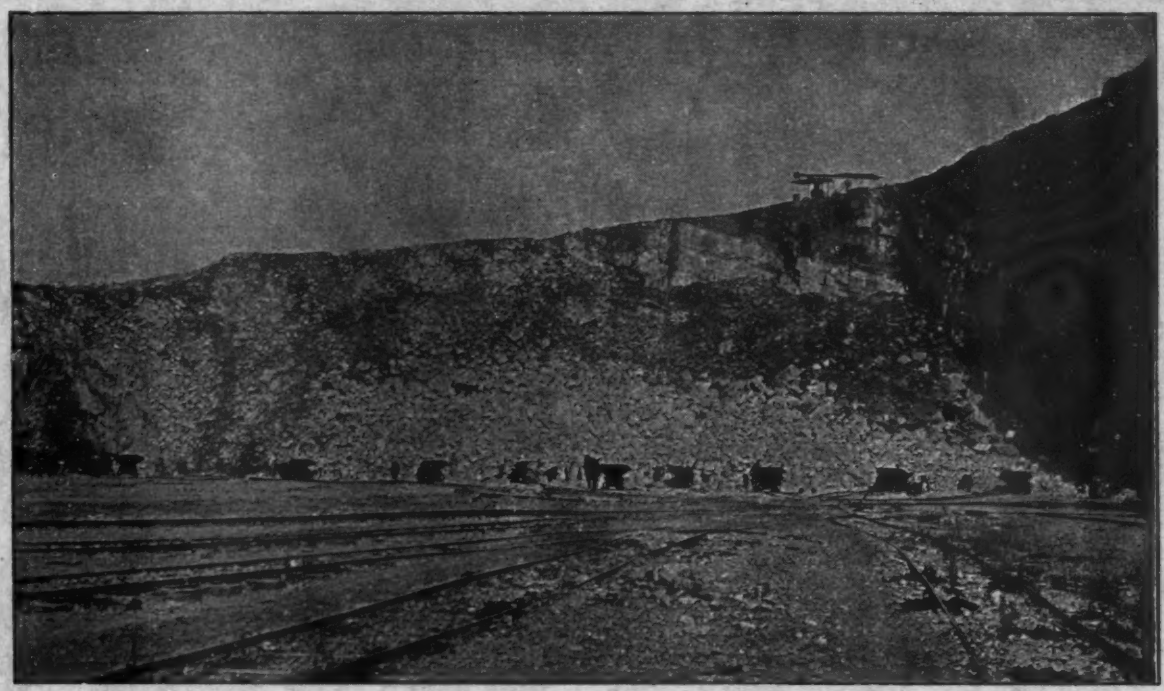

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